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RESEARCH ARTICLE

Notes on the morphology, distribution and bionomics of *Phyllodiscus semoni* (Anthozoa: Actiniaria: Aliciidae)

Заметки о морфологии, распространении и биологии *Phyllodiscus semoni* (Anthozoa: Actiniaria: Aliciidae)

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Abstract. *Phyllodiscus semoni* Kwietniewski, 1897, a little-known species of sea anemones of the family Aliciidae, is quite widely distributed in the tropics but has not been recorded from the Spratly Islands so far. The reason that the range of this species is poorly studied lies not only in the fact that many tropical areas are still poorly explored but also in the peculiar appearance of this animal in the sea. It rarely extends its tentacles during daylight hours and is not readily recognised by divers and researchers as an actinian. Our underwater observations, accompanied by high-resolution photography and specimen collection, evidence the presence of this species along the continental coast of Vietnam and in the waters of the Spratly Archipelago. During the dives, some observations were made on the behavior of the polyps and symbiotic shrimp living on their bodies. This species of sea anemones can cause severe skin burns in humans, which is confirmed by our experience. Summarised literature data on the distribution of *Ph. semoni* is provided.

Резюме. *Phyllodiscus semoni* Kwietniewski, 1897, малоизвестный вид актиний семейства Aliciidae, довольно широко распространен в тропиках, но до сих пор не был зарегистрирован у островов Спратли. Причина плохой изученности ареала этого вида заключается не только в том, что многие места тропической зоны все еще слабо изучены, но и в том, что это животное выглядит в море очень странно, редко показывает щупальца в дневное время и не опознается ныряльщиками и исследователями как актиния. Наши подводные наблюдения, сопровождавшиеся фотографированием с высоким разрешением и сбором материала, доказывают присутствие этого вида у континентального побережья Вьетнама и в водах архипелага Спратли. Во время погружений были сделаны некоторые наблюдения за поведением полипов и симбиотических креветок, живущих на их теле. Этот вид актиний способен сильно обжигать кожу человека, что подтверждается нашим опытом. В статье собраны все литературные данные о распространении *Ph. semoni*.

Key words: South China Sea, Spratly Islands, continental coast of Vietnam, synonymy, distribution, Cnidaria, Anthozoa, Actiniaria, Aliciidae, *Phyllodiscus semoni*, new records

Ключевые слова: Южно-Китайское море, архипелаг Спратли, побережье Вьетнама, синонимия, распространение, Cnidaria, Anthozoa, Actiniaria, Aliciidae, *Phyllodiscus semoni*, новые находки

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Introduction

Phyllodiscus semoni Kwietniewski, 1897 is one of the most unusual sea anemones, rarely encountered by both divers and collectors of museum materials. Its anatomical structure is fairly well-described (Crowther, 2013), but information about its behavior and even geographical distribution is quite limited. This is undoubtedly due to the difficulty of recognising individuals of this species on the seabed, as they skillfully imitate representatives of other groups of marine benthos in appearance. Special works are devoted to this remarkable peculiarity (Hoeksema & Crowther, 2011; Meij et al., 2018). The venom found in the body of this species has been examined in numerous biochemical studies (Nagai et al., 2002a, 2002b; Uechi et al., 2005a, 2005b, 2010, 2011; Satoh et al., 2007; Frazão et al., 2012; Ashwood et al., 2021). According to Erhardt & Knop (2005), as cited by Crowther (2013), a Filipino fisherman died as a result of his burns.

This species is quite widely distributed in the tropics but has not been recorded from the Spratly Islands so far. The reason that the range of this species is poorly studied lies not only in the fact that many tropical areas are still poorly explored but also in the peculiar appearance of this animal in the sea. It rarely extends its tentacles during daylight hours and is not readily recognised by divers and researchers as an actinian.

Material and methods

We had a total of eight well-preserved collection specimens at our disposal, as well as photographs taken in the sea and in an aquarium. These were accompanied by precise information about the place and time of the finds of this species. The specimens were collected by scuba diving during the expeditions of the Vietnam-Russian Tropical Research and Technological Centre, carried out in 2017 and 2021. In addition to the collected specimens, the series of high-resolution photographs taken in 2003, 2004, and 2005 also provide reliable identification of the species.

The collected specimens were preserved in a 10% seawater formaldehyde solution and, after one or two months, transferred to 75° ethanol for long-term storage. They were examined whole, and some were dissected to study the internal organisation. For the classification and terminology of cnidae, we used Carlgren's scheme (1940) modified by Bozhenova (1988) and Bozhenova et al. (1988). The higher classification of Actiniaria follows Carlgren (1949) and Fautin (2016).

All polyps of *Phyllodiscus semoni* considered in the present study are stored at the Laboratory of Marine Researches of the Zoological Institute, Russian Academy of Sciences, St Petersburg (ZIN RAS). The collection catalogue numbers of specimens (Nos. 12761–12768) and coordinates of locations are given in the "Materials examined" section. Photographs, unless otherwise indicated, were taken by O.V. Savinkin (A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow).

Results

Class **Anthozoa** Ehrenberg, 1834

Order **Actiniaria** Hertwig, 1882

Infraorder **Thenaria** Carlgren, 1899

Family **Aliciidae** Duerden, 1895

Genus ***Phyllodiscus*** Kwietniewski, 1897

Phyllodiscus Kwietniewski, 1897: 11; Kwietniewski, 1898: 407 (as "*Phyllodiscus* n. gen."); Carlgren, 1949: 44 (diagnosis); Fautin, 2016: 121.
Phillodiscus [sic!]: Uechi et al., 2005b: 761.

Phyllodiscus semoni Kwietniewski, 1897
(Figs 1, 2)

Phyllodiscus semoni Kwietniewski, 1897: 11–17 (as "*Phyllodiscus Semoni* nov. sp."); Kwietniewski, 1898: 407–410 (as "*Phyllodiscus semoni* n. sp."), pl. XXVII, figs 31–36, pl. XXVIII, fig. 37; Carlgren, 1949: 44; Nagai et al., 2002a: 2621–2625; Nagai et al., 2002b: 760–763; Mizuno et al., 2007: 402–414; Satoh et al., 2007: 1208–1210; Uechi et al., 2010: 1470–1476; Uechi et al., 2011: 625; Frazao et al., 2012: 1817, 1827–1829, 1832; Crowther, 2013: 197–205, figs 4.3, 4.43–4.47; Meij et al., 2018: 135–138, figs 1, 2; Ashwood et al., 2021: 452–469, figs 1g, 1h.
Alicia rhadina (non Haddon et Shackleton, 1893): Laboute & de Forges, 2004: 175.
Actineria villosa (non Quoy et Gaimard in de Blainville, 1833): Oshiro et al., 2001: 133–136; Oshiro et al., 2004: 225–228; Uechi et al., 2005b: 379–384.

Material examined. **Vietnam** continental coast: *Hon Tre I.*, 12°11′N 109°19′E, depth 3–4 m, bottom of large stones, 1 May 2017, 2 specimens (Nos. 12761 and 12762), coll. O.V. Savinkin [photos taken in sea and in aquarium on board of ship, Figs 1A, D, G, L]; *Hon Lon I.*, 12°33′N 109°26′E, depth 3 m, bottom of large stones, 2 Jun. 2021, 1 specimen (No. 12764), coll. S.D. Grebelnyi; *Hon Tre I.*, 12°11′47″N 109°17′29″E, depth 3 m, bottom of large stones, 21 Jun. 2021, 1 specimen (No. 12768), coll. S.D. Grebelnyi [photos taken in sea and in laboratory by S.D. Grebelnyi, Figs 1B, E, H]. Photos of three not collected specimens, taken in sea in 2003, 2004 and 2005 near Hon Tre I. (12°11′N 109°19′E). **Spratly Is.** (Trường Sa): *Da Nam I. / South Reef (North Danger Reef)*, 11°22′54″N 114°17′40″E, depth 29 m, bottom of limestone with live and dead colonies of stony corals, 31 March 2021, 1 specimen (No. 12763), coll. O.V. Savinkin & S.D. Grebelnyi [photo taken in sea, Fig. 1K]; *Da Lon I. / Discovery Great Reef*, 10°00′23″N 113°50′31″E, depth 13 m, bottom of limestone with live and dead colonies of stony corals, 6 Apr. 2021, 1 specimen (No. 12765), coll. O.V. Savinkin [photos taken in sea and in aquarium on board of ship]; *Nam Yet / Namyit I.*, 10°10′43″N 114°20′43″E, depth 12 m, bottom of limestone with live and dead colonies of stony corals, 12 Apr. 2021, 3 specimens seen, collected only one (No. 12767), coll. S.D. Grebelnyi & O.V. Savinkin [photos taken in sea]; *Thuyen Chai I. / Barque Canada Reef*, 08°16′45″N 113°21′49″E, depth 29 m, bottom of limestone with live and dead colonies of stony corals, 1 May 2021, 1 specimen (No. 12766), coll. S.D. Grebelnyi & O.V. Savinkin [photos taken in sea, Fig. 1J].

Morphology. When sampled during the daytime, the polyps have a flat, disc-shaped body shape. When disturbed or transported in an aquarium, they assume a taller, cylindrical shape. After fixation, they greatly constrict but remain soft, shapeless and have the appearance of a fluffy clod covered on all sides with a dense "fur" of thinly branched pseudotentacles. The most conspicuous feature of their appearance is the presence of round bubbles, which vary greatly in size and are scattered among the pseudotentacle branches.

Foot, or pedal disc, rather narrow, thin, curved, easily extending into temporary lobes enfolding dead corals and other protruding substrate parts (Figs 1E, 2D). Lowermost part of column distal to pedal disc bare; distally, entire surface of column densely covered with outgrowths of body wall, so called pseudotentacles (Fig. 1E). Muscular bands, probably being branches of longitudinal muscles of mesenteries, entering cavities of these outgrowths, enabling pseudotentacles contraction and relax, greatly altering general appearance of polyp (Figs 1I, 1F, 1C). Pseudotentacles and sometimes surface of column itself supplied with spherical vesicles containing powerful nematocysts, i.e. microbasic and macrobasic amastigophors. Distal part of column, capitulum, very short, without pseudotentacles, provided with ectodermal longitudinal muscles. It rarely visible, even in polyps being spread out in aquarium. Sphincter very weak, diffuse. Margin tentaculate. Oral disc (as seen in polyps in sea or in aquarium) small, much smaller than pedal disc (Figs 1A, C). Twelve largest mesenterial pairs forming first and second hexamerous cycles (marked with black dots in Fig. 2A). At least these two cycles attached to pharynx, as seen in living polyps due to transparency of oral disc, being thus perfect mesenteries. Twelve pairs (marked with white dots in Fig. 2A) reaching oral disc and forming third, also regular hexamerous cycle. Only one tentacle clearly associated with endocoels of mesenterial pairs of these three older cycles, as in almost all benthic actinians (with exception of Stichodactylidae, Actinodendridae, Thalassianthidae, Capneidae, Homostichanthidae, and Liponematidae). Tentacles of next, fourth and fifth cycles marked with red dots in Fig. 2A. While 24 tentacles of fourth cycle forming regular hexagon cycle, tentacles of fifth cycle visible in not all exocells between them. In most of these exocoels, they undoubtedly present, but this cannot be confirmed visually. Longitudinal muscles of tentacles and radial muscles of oral disc ectodermal. Tentacles in five cycles (6+6+12+24+?48). One siphonoglyphs. At least two cycles of perfect mesenteries. Six pairs of sterile mesenteries. Gonads on mesenteries of second cycle. Retractors diffuse, weak. Basilar muscles rather distinct. Cnidom including spirocysts, basitrichs, microbasic, and macrobasic *p*-rhabdoids.

Remarks. Although we have many photos of *Ph. semoni* in nature and sufficient number of fixed specimens in alcohol, it has proven challenging to ascertain the number of tentacles in polyps of this species. The oral disc with the tentacles remains retracted during the collection of specimens, which was only conducted during daylight hours. Only a few individuals release their tentacles after placing them in an aquarium for several hours or days, but even then they do not spread them out widely. The disc-shaped body, flattened in the oral-aboral


A
B
C
D
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E
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direction in almost all fixed polyps, makes it difficult to examine the location of the mesenterial pairs and the tentacles associated with them. So it would be very difficult to count them even on cross sections. In addition, the work is complicated by the very thin, soft and extensible mesoglea of the body wall, mesentery and tentacles. These peculiarities, which complicate the anatomical dissection of *Phyllodiscus* polyps, compel us to describe the location of the mesenterial pairs and tentacles primarily using photographs of living individuals.

The specimens we studied, which are not the largest, have only five cycles of tentacles, although Carlgren (1949) and, subsequently, Crowther (2013) reported the presence of a sixth cycle. Carlgren (op. cit.) mentioned "up to 160 tentacles", while Crowther (op. cit.) pointed out that there may be as many as "about 200". Carlgren (1949) noted the presence of "small stinging spots" on the surface of the tentacles. In our photographs, the ectodermal epithelium exhibits distinct thickenings, apparently formed by the accumulation of nematocysts. These thickenings are clearly distinguishable in live individuals (Fig. 1B) and are particularly prominent on shrunken tentacles of fixed specimens (Figs 2B and C).

Contrary to the observations of Carlgren (1949), our photographs clearly show the presence of only one siphonoglyph (Figs 1D, 2C) and not two. This may support the presence of asexual reproduction reported by Crowther (2013), in which usually only one siphonoglyph is retained due to longitudinal division of the polyp. Carlgren (op. cit.) pointed out the presence of only six pairs of the perfect mesenteries; however, our photographs show that there are at least two older mesenterial cycles attached to the upper part of the pharynx (Figs 1A, D and 2A).

Distribution. As mentioned above, most divers and collectors do not recognise the polyps of *Ph. semoni* as actinians, so its geographic distribution is poorly studied. The range of the species is delineated here mainly based on the specimens examined by Crowther in old museum collections (see Table 4.18 in Crowther, 2013) and also on the keen observations of J.C. den Hartog, who collected extensive material on *Ph. semoni* during the Dutch expeditions conducted by the National Museum of Natural History in Leiden, The Netherlands. This data is supplemented by a few recent works (Halstead, 2000; Erhardt & Knop, 2005; Meij et al., 2018; Ashwood et al., 2021). Despite a misnaming in a popular publication (Laboute & de Forges, 2004), we consider it a reliable source due to the unequivocal photograph of *Ph. semoni* it includes.

The taxonomic affiliation of the sea anemones mentioned in toxicological studies (Oshiro et al., 2001, 2004; Uechi et al., 2005a, 2005b) under the name *Actineria villosa* should be treated with caution due to the confusion of the two species, *A. villosa* and *Ph. semoni*. Hoeksema & Crowther (2011) emphasise this point, referring to some photographs included in these papers. Additionally, we would like to note that the high similarity of amino acid sequences of toxins (Satoh et al., 2007) isolated from samples attributed to *A. villosa* and those reliably belonging to *Ph. semoni* suggests that all Japanese specimens belong to the latter species. Thus, according to currently available data, the range of *Ph. semoni* extends to Okinawa, and the genus *Actineria* de Blainville, 1830 has a more southern distribution (for more details, see Hoeksema & Crowther, 2011: 262).

The first report of the presence of *Ph. semoni* in the shallow waters of continental Vietnam was published by Hansen & Halstead (1971), who dis-

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Fig. 1. *Phyllodiscus semoni*, general appearance of living polyps, in aquarium onboard of research vessel (A, C, D, F, I) and in sea (B, E, G, H, J, K, L). **A**, **D**, oral disc and siphonoglyph of one of two polyps collected and photographed together (Nos. 12761 and 12762), Island Hon Tre, 5 m depth; **B**, **E**, **H**, polyp (No. 12768) from Hon Tre, Island 3 m depth (B, taken from the seabed together with the symbiotic shrimp *Ancylocaris brevicarpalis*; E, foot feebly attached to dead coral; H, *in situ* at the bottom); **I**, **F**, **C**, subsequent stages (I→F→C) of spreading out (collected and photographed 16 Nov. 2004), Khanh Hoa Province, Hon Tre Island, 5–6 m depth; **J**, polyp at the bottom (No. 12766), Thuyen Chai Island, 29 m depth; **K**, polyp at the bottom ("Alcyonacea-variety") (No. 12763), North Danger Reef, 29 m depth; **G**, **L**, polyp at the bottom ("cake-variety") (L) and its magnified part (G) (one of two polyps collected together, Nos. 12761 and 12762), Island Hon Tre, 3–4 m depth. Abbreviations: *siph* – siphonoglyph. Photos by S.D. Grebelnyi (B, E, H). Scale bars: 6 cm (H), 18 cm (J).

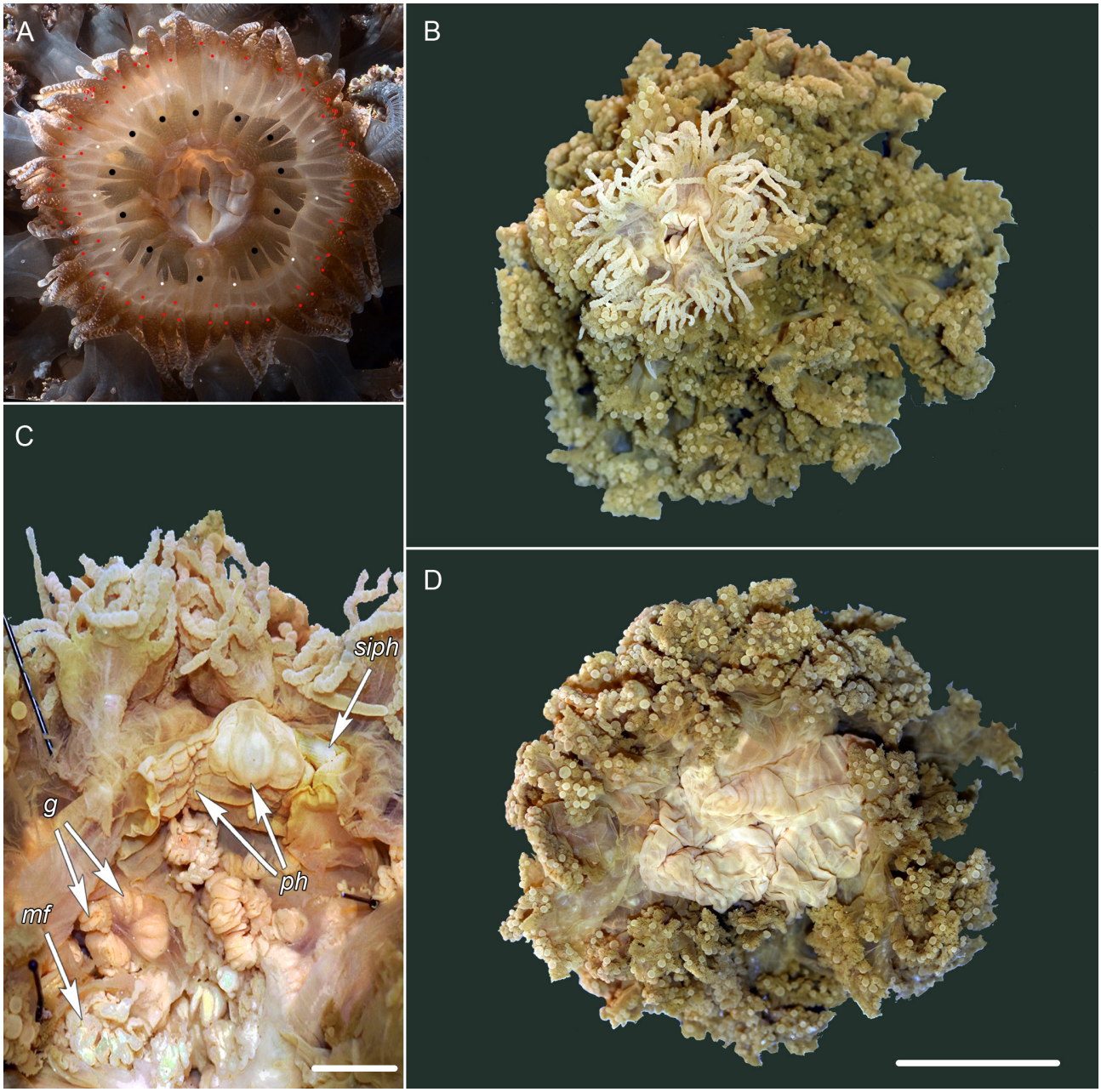

Fig. 2. *Phyllodiscus semoni*, oral disc of living individual (A) and preserved specimen (B–D) (No. 12762), Island Hon Tre, 3–4 m depth. **A**, arrangement of the tentacles from the cycle 1 to cycle 5 on the oral disk; **B**, **D**, polyp in 70° alcohol, view from the oral side (B) and from the foot, or pedal disc (D); **C**, the same fixed specimen; the wall of column and pharynx is dissected to show the internal structure of animal. Abbreviations: *g* – gonads; *mf* – mesenterial filaments; *ph* – pharynx with large thin-walled swellings; *siph* – siphonoglyph. Photos by by N.Yu. Ivanova (B–D). Scale bars: 1 cm (C), 6 cm (D).

cussed the adverse effects of contact with this venomous actinian. At that time, it was erroneously identified as *Actinodendron plumosum* Haddon, 1898 (for details, see Hartog, 1997 and Crowther, 2013).

Below we list all the reliable records of *Ph. semoni*, both published and new. Most of the locations where it has been found are already listed in Crowther (2013); all additional data not included in this work are provided by us with corresponding

references. Geographical coordinates of records, if they are not given in publications, are determined by us approximately.

Arabian and Laccadive seas, *Maldives*: Velavaru Island (2°41′46″N 72°51′47″E), depth 2 m; Ihuru Island (4°18′24″N 73°24′58″E), depth 2 m; Ari Atoll (3°52′60″N 72°24′58″E); depth undesignated (Erhardt & Knop, 2005).

Java Sea: Kepulauan Seribu Islands (5°42′S, 106°35′E), depth 2 and 33 m.

South China and Sulu seas, *Borneo Island*: northern tip of the island (7°01′50″N 117°00′41″E, 7°02′34″N 117°27′58″E, 7°11′33″N 117°23′38″E), Kudat Cape (6°52′05″N 116°51′27″E), Semporna (4°28′54″N 118°36′40″E), depth unknown (Meij et al., 2018).

Celebes Sea: north-eastern Borneo, near Tawau and Semporna (4°06′45″N 118°13′30″E, 4°26′54″N 118°46′31″E), depth unknown (Meij et al., 2018).

South China Sea, *Vietnam* continental coast: Cam-Ranh Bay (11°55′N 109°09′E), depth several meters (Hansen & Halstead, 1971; present article); Nha Trang, Island Hon Tre (12°11′N 109°19′E) and Island Hon Lon (12°33′N 109°26′E), depth 2.5–6 m (present article).

South China Sea, *Spratly Islands*: Da Nam / South Reef (North Danger Reef) (11°22′54″N 114°17′40″E), depth 29 m; Da Lon / Discovery Great Reef (10°00′23″N 113°50′31″E), depth 13 m; Nam Yet / Namyit Island (10°10′43″N 114°20′43″E), depth 12 m; Thuyen Chai / Barque Canada Reef (08°16′45″N 113°21′49″E); depth 29 m (present article).

Philippines: east side of Palawan Island (9°44′27″N 118°43′48″E), depth 5 m; Luzon Island, depth unknown; Cebu Strait (9°49′39″N 123°41′26″E), depth 2–3 m.

East China Sea, *Japan*: Okinawa, Itoman (26°07′25″N 127°39′57″E), depth unknown; Okinawa, Seragaki Island (26°30′16″N 127°52′19″E), depth 33 m.

Molucca Sea, *Maluku Islands*: Halmahera Tanjung Sidangole (0°53′08″N 127°29′00″E), Ternate Island (0°47′N 127°22′E), depth 6–12 m.

Banda Sea: Pulau Mersegu Island (3°00′S 128°03′E), depth 0–30 m; Ambon Island (3°40′36″S 128°10′44″E) (syntypes locality), depth 0–5 m.

Java, Banda, Sulawesi, and Molucca seas, *Sulawesi Island*: Selat Lembeh (1°26′N 125°13′E), depth 1–6 m; Spermonde Archipelago (5°02′58″S 119°19′09″E, 5°06′08″S 119°17′17″E, 4°52′32″S 119°06′52″E, 5°07′56″S 119°21′38″E), depth 2–23 m; Palau Tanakeke (5°30′S 119°18′E), depth 6–8 m; Samalona Island (5°08′S 119°21′E), depth 1.5 m; Taka Bone Rate Island (6°41′S 121°9′E); depth 10–11 m.

Komodo Island (8°36′S 119°26′E), depth unknown.

Coral Sea, *New Caledonia* (22°S 166°E), depth unknown (Laboute & de Forges, 2004).

Coral Sea, *Australia*: Queensland, Low Isles (16°23′37″S 145°34′22″E), depth unknown; Off Townsville (19°15′32″S 146°49′01″E), depth unknown; Great Barrier Reef, depth unknown (Ashwood et al., 2021).

Additional observations

According to our observations, polyps of *Phyllodiscus semoni* always settle in open areas. They do not hide at all unlike most large tropical anemones, which are able to completely retreat in the sand or be located in small caves on the reef and retreat in cracks between blocks of limestone.

Instead, *Ph. semoni* attaches itself to the tops of large stones or even to the branches of dead coral. Due to the presence of unusual, variously arranged outgrowths on the column wall, large polyps of *Ph. semoni* closely resemble other common reef inhabitants, such as branched calcareous colonies of scleractinian corals and bryozoans, which are unattractive to most predators. Hoeksema & Crowther (2011) explain the remarkable appearance of these anemones as a form of mimicry.

Symbionts and parasites. In many shallow-water actinians, especially tropical ones, endodermal tissues contain unicellular symbiotic algae (zooxanthellae). This is also true for *Ph. semoni*, whose pseudotentacles are particularly rich in zooxanthellae (Figs 1B and J). The coloration demonstrates that this species has little or no symbiotic algae in its white true tentacles (Figs 1B and C). This fact may be further evidence that this anemone hunts and eats its prey mainly at night, for which purpose it extends its tentacles in the dark, as previously discussed by Gladfelter (1975).

During our dives near Nha Trang (Dambay Bay, Island Hon Tre, 12°11′47″N 109°17′29″E), we found the symbiotic shrimp *Ancylocaris brevicarpalis* Schenkel, 1902 (Palaemonidae) associated with *Ph. semoni*. An actinian along with a dead

branch of stony coral was lifted from the seabed to the sea surface. Under sunlight, the disturbed polyp attached to a coral branch released its white tentacles after approximately 20 minutes required for photography (Fig. 1B), although the tentacles are usually hidden inside the column during the day (Hoeksema & Crowther, 2011: 252). Finally, the foot, or pedal disc, detached from the substrate, and the anemone drifted freely in the water, carried away by the current. When the specimen was placed in a plastic bag, the symbiotic shrimp remained on the polyp body. Only a day later, the shrimp moved to the bottom of the aquarium.

According to the reports of many authors (Fransen, 1997; Humann & DeLoach, 2010; Hoeksema & Crowther, 2011: fig. 4.43A), the shrimps *Ancylocaris brevicarpalis* Schenkel, 1902, *Anocylomenes sarasvati* (Okuno, 2002), and *A. venustus* (Bruce, 1989) belonging to the family Palaemonidae often live on the bodies of *Ph. semoni* individuals and around them. However, according to S.E. Anosov (personal communication), all these shrimps can easily live in an aquarium in the absence of anemones.

Therefore, it is difficult to determine unambiguously whether shrimps are simply lodgers or commensals deriving some benefit from cohabitation with the anemone, or whether the observed symbiosis can be considered mutually beneficial for both shrimps and the anemone. Once more, it is likely that shrimps benefit from the protection of the anemone which has potent stinging capsules. Nonetheless, these shrimps are widespread in the Indo-Pacific region and do not show strict association with a specific host. They are found not only on sea anemones but also on stony corals.

In the gastral cavity of *Phyllodiscus*, the gastropod mollusc *Globiscala arjani* Kokshoorn et al., 2007 (Gastropoda: Caenogastropoda: Epitoniidae) was found. Malacologists tend to consider the mollusc a parasite of the actinian (Kokshoorn et al., 2007). Subsequent studies suggested that wentletrap snails of the genus *Epitonium* Linnaeus, 1758 belonging to the same family may live inside of this anemone (Hoeksema & Crowther, 2011; Crowther, 2013). The assumption of cohabitation of *Epitonium* with *Ph. semoni* may be inaccurate, as Kokshoorn et al. (2007) only reported finding an empty *Epitonium* shell "between coral rubble underneath *Phyllodiscus semoni*". However, if not endoparasitism, then at least attacking anemones, biting off the ends of tentacles and "sucking up body fluids" were noted for molluscs of the genus *Epitonium* a long time ago (references to publications describing these cases are collected in Kokshoorn et al., 2007).

Polymorphism. Thanks to a remarkable article by Hoeksema & Crowther (2011), it is now well known that individuals of *Ph. semoni* can sharply differ from each other in appearance (see Figs. 3A, 3C, 4A, 4C, 4E in Hoeksema & Crowther, 2011). Polyps of various structures can occur separately, but sometimes occur in aggregations which can arise as a result of asexual reproduction. These authors identified many morphotypes, that is, clearly distinguishable variations of individuals resembling predominantly dead rock covered with algae, branching or encrusting corals (scleractinians and alcyones). The presence of numerous morphotypes even makes it surprising that only one species in this aberrant genus has been described so far.

Predation: enemies, predators or preys. Hoeksema & Crowther (2011) believe that the resemblance to algae or inedible animals allows the anemone to avoid attacks from enemies. However, being one of the most venomous sea anemones, this species is unlikely to fear attack by most predators. Rather, we should agree with another assumption of the authors: the similarity of *Ph. semoni* with boulders covered with algae, bryozoans, or scleractinians allows it to act as a predator and openly lie in wait for its prey. Unlike most other reef anemones, which shelter in caves or crevices and rarely leave their sedentary places, this species appears to lead the life of a "wandering hunter," readily leaving an occupied substrate and easily attaching itself in another place.

As noted above, in the description of the anatomy, the mesoglea of the body wall, of mesenteries and pharynx is very thin, soft, extensible, more delicate than those in other reef anemones. In this respect, *Ph. semoni* is similar to the predatory polyps of Ptychodactiaria, which, as is known, can swallow entire alcyonacean colonies (England & Robson, 1984) or "lick off" soft tissue from gorgonian colonies, leaving a bare skeleton (Dayton et al., 1997). The thinness and great extensibility of the body of *Ph. semoni* can perhaps be considered an additional evidence of its unusual lifestyle and mode of feeding.

Venomousness. This species is known to be harmful to humans (Nagai et al., 2002a, 2002b; Mizuno et al., 2007; Frazão et al., 2012), as evidenced even by its indigenous name "Fusa-unbachi-isoginchaku", which means "tassel-shaped wasp sea anemone" in Japanese (Oshiro et al., 2004; Uechi et al., 2005a, 2006b). Toxins of this animal cause not only skin lesions in humans (ulceration and swelling that often takes months to resolve) but also impaired renal function (Nagai et al., 2002a, b; Mizuno et al., 2007).

More recent observations, in particular the unpleasant experience of our regular photographer O.V. Savinkin, indicate that not only direct contact with the stinging pseudotentacles of this anemone, but even splashes of water in which it was kept for several days can cause painful, long-lasting wounds that do not heal for several weeks.

Despite its very variable and sometimes unsightly appearance, or perhaps precisely because of its inconspicuous appearance (see Figs 1H, K, L), anemones of this species sometimes cause certain damage to the tourist business. According to Crowther (2013), who refers to the personal communication of Dr J.D. Reimer, bathing beaches in Okinawa, Japan, have to be closed during some seasons due to increased numbers of *Ph. semoni* in coastal waters.

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